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Do undergraduates use their personal computers to support learning?

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Abstract

Computer activity data was extracted from the personal laptops of eighteen third-year students who self-reported as being skilled computer users. The analysis of the data revealed that non-academic use of students' personal computers was significantly higher compared with academic use. This was the case concerning the discrepancies between what students' self-reported as their level of use compared with their actual use. The findings illustrate that personal computers were not as crucial to undergraduate academic study as expected. In addition, the findings offer important insights into the benefits—in understanding actual practice—of using data-capturing techniques aimed at gathering naturally-occurring data.

Keywords: academic work; actual practice; e-learning; higher education; non-academic work; personal computer; self-report of practice; study habit

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1. Introduction

The use of Information and Communications Technology (ICT) has grown enormously in the last 10 years with computers and smart devices becoming indispensable to our daily lives. Personal computers are seen as vital for those wishing to engage in higher education (Charter Colleges and Universities Participating in the National Higher Education ICT Initiative, 2003). While this is a claim that few of us would refute, we have very little research on how students are using their personal computer devices to support their academic practice (Sharpe, Benfield, Lessner & DeCicco, 2005). Furthermore, much of the research pertaining to student learning is based on perception data rather than data concerning their actual practice. This scoping study thus sought to address this gap by exploring the possibility of capturing naturally occurring data from students' personal computers through installing software that tracked predefined aspects of use (e.g. Library database, Learning Management System, Word, etc).

2. Method

Participants were selected based on a set of criteria. Approval was then gained from the participants regarding the installation of the software on their personal computers, and data was extracted at the completion of the first quarter of the semester. The idea of naturally-occurring data, gathered as a result of students using their computers, was seen as an accurate method of revealing application types used and their computer technology engagement when studying over the first six weeks of the fieldwork period. In this way we were able to focus on the context(s), the extent to which software applications and web services were used to support undergraduate academic practice with personal computers - at what times and for how long. This approach offered what appeared to be an ideal way to capture students' actual use of their personal computers, as opposed to the traditional approach of soliciting post-event recollections through surveys and interviews.

2.1. Participants and Recruitment

Forty third-year students enrolled in undergraduate degree programmes were randomly selected for participation. Thirty students who showed their interest were invited to undertake a short questionnaire to gain some understanding of their perceived use of, and abilities with, computer technology. The questions appear in Table 1.

Table 1. The five questions in the questionnaire

1	Is access to a computer really important for your university study?
2	Which of the following best describes you? a. I love technologies and am among the first to experiment with as well as use them before most people I know. b. I usually use new technologies when most people I know do and sometimes I will be one of them. c. I am sceptical of new technologies and use them only when I have to.
3	Please indicate the ratio (within 10) of how much you use computers in your studies compared to other aspects of your life.
4	How do you rate your ability to use computers?
5	What is your skill level for the following? - using the university library website - spread sheets - presentation software - graphics software - computer maintainese - internet information searching - evaluating the reliability and credibility of online sources - using digital information from various access

Question one sought the participants' views on the importance of computer access for their university study, while question two asked how proficient participants were in the use of technology in their daily lives. These two questions were necessary to indicate the participants' views on the importance of personal computer use in their undergraduate lives. Question three invited the participants to self-rate on the extent of computer usage between study and non-study. This question was important to compare the students' self-reported practice and provide data against which to compare their actual practice that gathered through the extracted computer activity logs. Question four requested a more general rating of participants' overall perception of their computer skills. Question five required the participants to rate their abilities in different aspects of computer usage. These last two questions determined the participants' computer 'savvy-ness'. In addition, the results of these two questions were used for final selection of participants for this dataset in this study.

Of the 30 who replied, 25 self-reported as average or expert computer users to question four. 18 (male-9 and female-9) with the highest scores (average or expert in at least four specific computer usages in question five) were recruited. All 18 participants' questionnaire replies were summarised and the data was assembled in the format of tables. Any remark provided by any participant was noted down for analysis reference. The questionnaire replies were kept as a preliminary dataset to compare participants' self-reports and their actual use of personal computers in academic practice.

2.2. Computer Activity Data

The Computer Activity Data was a core dataset. These data were gathered using a free software programme, ManicTime, which is known as "Personal time management software for logging and tracking work hours" (Mininday, 2009). ManicTime resides in the background of the computer reducing its intrusion on users' normal computer use. The core benefit of using ManicTime for this study was its function as a personal, time-tracking tool, thus providing monitoring at a rudimentary level. ManicTime only tracks the software programmes that are being used, the websites visited (through capturing the Uniform Resource Locators - URLs) and the documents that are accessed (for example "Assignment_1.doc"). At the same time, it records the duration of time the students engaged in these activities. The data gathered in this way was not reliant on the students keeping records and thus yielded more authentic information than could be gained from asking students about their computer usage.

ManicTime was downloaded onto each participant's computer and configured to record the programmes or websites used, as well as documents accessed, at what dates/times and for how long, over the first six weeks in semester one. All the participants were invited to attend a briefing session where the software was explained and training was given on software functions; this included the ability to turn it on/off and delete any record. All those who were invited, attended the briefing session. The software captured the programmes and web services that students were using on a regular basis. The information was calculated "on the fly" and available for viewing by the student by clicking on an icon on the task bar. ManicTime is a detailed computer activity tracking application. At the click of an icon situated in the task bar, live data is presented in both tabular and graphical forms. These displays include the top applications used, top documents accessed, and computer usage within a certain duration. An example of the displays is shown in Figure 1.

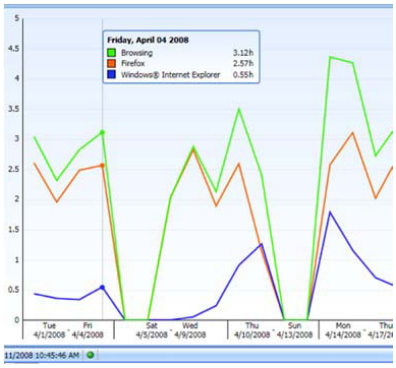

Fig. 1. Computer usages by duration and top applications used within duration (Mininday, 2009)

2.3. Computer Activity Data Analysis

At the end of the first six weeks of semester one, the lead researcher (the first author) met with each of the 18 participants to extract their computer activity dataset. This included figures and tables of Day, Duration, Top Applications, Top Documents, Top Computer Usage and some Custom fields.

The extracted computer activity data was then imported to Microsoft Excel for calculation and generation of more targeted tables and figures according to categories. This involved reducing the dataset to the top three software applications and web services used. Categories were generated based on the data captured.

A summary of the categories is shown in Figure 2.

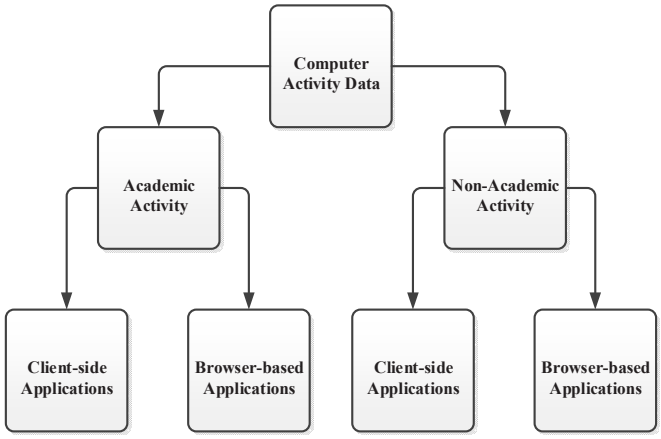

Fig. 2. Generation of categories from the computer activities

As shown in Figure 2, the filtered dataset was divided into two categories titled Academic Activity and Non-Academic Activity. Academic Activity refers to software, documents or web services that were related to the participants' academic study. Non-Academic Activity includes all other uses, such as banking, entertainment

sites, Facebook groups, etc. The distribution of the categories was not difficult given that all the URLs and file names accessed were recorded in the computer activities list.

The Academic Activity and Non-Academic Activity categories were then divided into Client-side Applications (e.g., Microsoft Office) and Browser-based Applications. Client-side Applications refers to all the built-in application programmes on personal computers used for different purposes. Browser-based Applications include website services (e.g., Blackboard) and website pages (e.g., Wikipedia).

In summary, this dataset traced the students' actual use of personal computers (software applications, web-based services/pages and documents) for their daily undergraduate academic practice as documented by the software programme.

3. Findings

3.1. Participant Selection Data

The participants were selected based on self-reports of their degree of computer literacy. This was measured using the responses to the five questions relating to computer use and perceived aptitude with computer technology listed in section *2.1* above. Of the 25 students who rated their computer use/aptitude as average to expert, 18 with the top highest scores were selected to undertake the study.

In question one, students were asked to state whether they agreed, were neutral or disagreed with the claim 'Access to a computer for university study is important'; all but one of the participants selected the 'Agree' option. The one participant who did not make a selection chose instead to make a comment: "A computer is important when you have poor teachers. You will have to teach yourself to learn." - An interesting comment from a person who had reported being an expert computer user.

The second question aimed at ascertaining the students' overall confidence and interest in adopting new technologies. Of the 18 students, only five regarded themselves as early adopters, with the majority (n=10) stating they saw themselves more as followers than as early adopters when it came to using new technologies. The remaining three, while comfortable with technology, considered they were sceptical when it came to new technologies.

Question three explored how the students used their personal computers for both academic (study) and non-academic use (other aspects of life). Nine of the 18 felt they had a balanced approach to computer use for academic and non-academic purposes with the other nine stating they were more likely to use their personal computer for academic than non-academic purposes (see Table 2).

Table 2. Student self-perception measure of their academic and non-academic computer use (Q3)

Participants	Percentage (%)	
	Academic Use	Non Academic Use
1	60	40
2	60	40
3	70	30
4	50	50
5	50	50
6	50	50
7	50	50
8	50	50
9	50	50
10	40	60
11	40	60
12	40	60
13	40	60
14	40	60
15	40	60
16	40	60
17	30	70
18	20	80

Question four asked students to self-rate their ability in using computers. All 18 reported their ability as average to expert. As for their ability in using specific computer applications (question five), all 18 students rated themselves as average to expert users against a list of common software programmes and web services.

3.2. Computer Activity Data

As shown in Figure 2 above, the computer activities list was divided into client-side applications (e.g., Microsoft Word or Windows Media Player) and browser-based services (e.g., Blackboard or Facebook). At the level of application use, the computer activities revealed the most popular application was the browser, with browser-based use considerably higher than client-side software programmes (average = 96.59%). The top three browser-based services were Facebook and YouTube which accounted for about 52.74% of students' overall computer usage, with Google (average = 2.92%) the next on the list. As for client-side applications, Microsoft Office was ranked the highest (average = 7.18%) followed by the file management application, Windows Explorer (average = 4.92%), and Adobe/Foxit Reader (average = 3.48%). Table 3 below shows the total use of client-side software and browser-based services retrieved from every participant's computer activity data.

Table 3. Student use of client-side software and browser-based services

	Percentage (%)	
	Client-side Software	**Browser-based Services**
1	13.42	86.58
2	98.86	1.14
3	12.25	87.75
4	19.05	80.95
5	17.53	82.47
6	12.05	87.95
7	14.21	85.79
8	13.93	86.07
9	3.87	96.13
10	26.25	73.75
11	24.70	75.30
12	21.00	79.00
13	14.31	85.69
14	27.95	72.05
15	47.15	52.85
16	44.72	55.28
17	17.65	82.35
18	22.03	77.97

The computer activities were then divided into two main categories: Academic and Non-Academic Work (this includes both client-side software and browser-based services). Table 4 below shows the actual practice of how participants used computers in their studies compared with how they used them in other aspects of their life.

Table 4. Computer activities for comparison of academic vs non-academic use

Participants	Percentage (%)	
	Academic	**Non-academic**
1	10	90
2	90	10
3	10	90
4	10	90
5	20	80
6	10	90
7	10	90
8	10	90
9	10	90
10	10	90
11	20	80
12	10	90
13	10	90
14	10	90
15	10	90
16	10	90
17	10	90
18	10	90

The problem of using self-reports to express practice in regard to computer use is highlighted by the discrepancy found between the self-perception questionnaire data (Table 2) and computer activity data (Table 4). From the questionnaire data, students perceived that they either struck a balance in the use of computer technology between study and other aspects of life or had a higher computer technology usage for study. The actual practice (computer activities), however, revealed the opposite. Seventeen out of 18 of the students used computer technology 80%-90% more in other aspects of life (non-academic use) than in academic work (compare Table 2 and Table 4).

In summary, Computer Activity Data revealed:

- the difference in usage between the top-ranked client-side software programmes (Microsoft Office 7.18% and Window Explorer 4.92%) and browser-based services (YouTube and Facebook 52.74%).
- the high percentage of browser-based services use among undergraduate students (average of 96.59% among 18 participants).
- the high non-academic use of personal computers in undergraduate students' actual practice compared with their academic use (average of five times more on non-academic use).

4. Discussion

The findings showed that while most of the participants reported that their use of computers was predominately for academic purposes, the computer activity data of actual use revealed the reverse. This highlights the considerable disparity between what students think they are doing and what they are actually doing when it comes to computer usage.

The difference between the students' use of client-side software applications (low use) and browser-based services (high use) as shown in Table 3, would suggest that undergraduates are less reliant on the various software applications installed on their laptops than they are on the browser to access the World Wide Web. The data also showed that daily, non-academic use of their personal computers was significantly higher compared with their academic use (Table 4). Given the high level of belief and confidence expressed by the participants regarding the importance of computer technology in higher education, it might be logical to assume that they would be avid users of both client-side software and web-based services for academic use. Instead, the data showed that a dominant use of personal computers by these undergraduate students is for socialising (social networks, such as, Facebook, and email), personal web services (Trading sites and online banking) and entertainment (YouTube, music and movies). The low level use of academic-related software/web services compared with non-academic use sends a clear message that for these 'computer savvy' third year students, personal computers were not as crucial to their academic study as was expected or as current research has argued (Aspden & Thorpe, 2009; Dahlstrom, 2011; Guidry & BrckaLorenz, 2010; Smith & Caruso, 2010).

This study suggests that for these participants there appears to be something about academic practice that is not conducive to technology use. Given that the predominate use of apps by these students outside of their academic practice is 'social', could it then be assumed that the 'social' is missing from academic practice? These findings are somewhat perplexing given that much of the literature regarding students' use of personal computers highlights the prominence of these devices for academic use with a number of these studies claiming that personal computers now play a significant role in supporting undergraduate study (Aspden & Thorpe, 2009; Dahlstrom, 2011; Guidry & BrckaLorenz, 2010; Smith & Caruso, 2010). So why did the findings from this study differ significantly from previous studies? Most studies on student use of computers in higher education rely on perception data, often gathered via surveys and questionnaires. The perception data gathered from students in the current study - questionnaire data - were similar to the findings presented in the literature. However, the data gathered from student's actual practice – computer activity data - showed something very different.

The difference between the students' beliefs about their personal computer use and their actual computer use highlights that self-report data reliant on post-event recollections should not be relied on to represent actual practice. Studies employing perception data might have led to the assumption that the extent of computer use to support higher education study was high. However, the naturally-occurring data captured in this study revealed computer use for academic purposes was very low.

5. Limitation

It must be acknowledged that some participants viewing the computer activity data that was being captured were surprised (e.g., duration of time on Facebook) and did state they were going to change their behaviour as a result. Such behaviour awareness was not expected at the beginning of the study. The awareness, however, did not appear to change behaviour dramatically, but it did provide a degree of self-awareness regarding their computer usage which could have resulted in minor change. Students also had the ability to turn the software application on or off, as well as the ability to delete activities. We were not sure to what degree students actually employed these options.

6. Conclusion

Drawing on actual practice data, this study was an initial attempt to understand the role personal computers play in supporting undergraduate students' academic practice. The aim was to discover the manner in which undergraduate students integrate technology into their learning, and the ways they use technology to support and develop autonomous learning. This study explored the potential of methods focused on capturing naturally occurring behaviour in comparison with gathering post-event recollections through student self-reporting. It is hoped that the findings generated from this study will help inform the growing literature on undergraduate student use of computer technology. The findings are relevant to the broader tertiary population in that they will help to engender awareness of a different way to understanding research into student behaviour. Further, the study adds another voice or aspect to the growing interest in the role and impact that computer devices are playing in education.

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